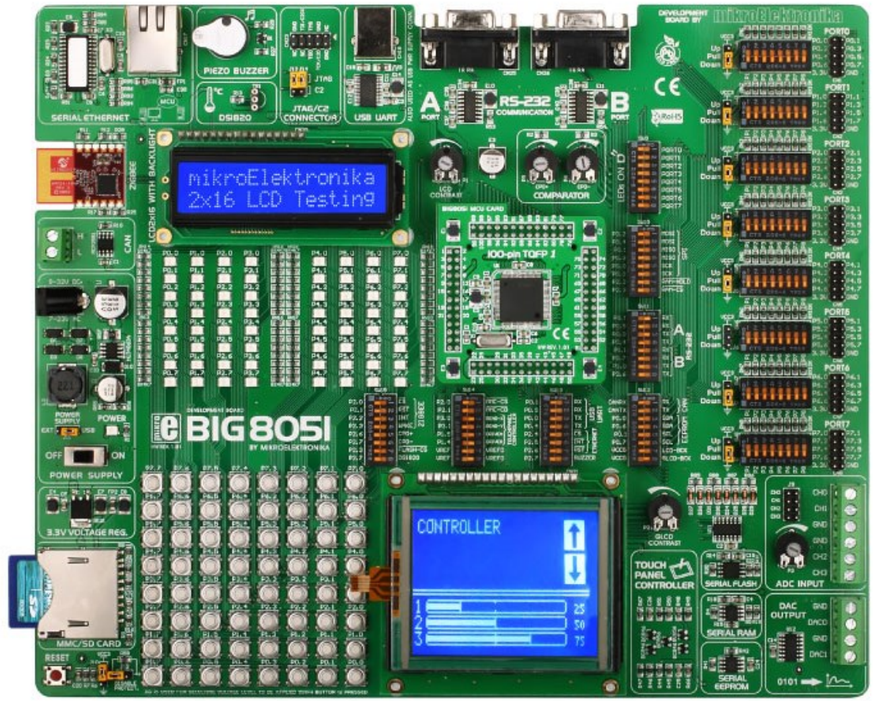
User Manual



BIG 8051

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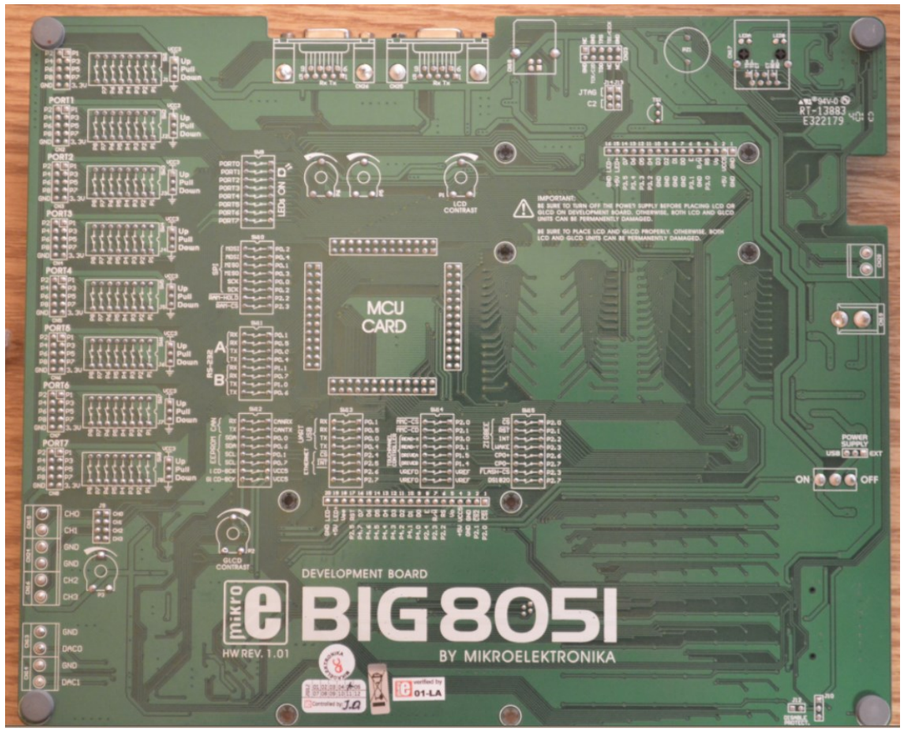
General information

The BIG 8051 development system provides a development environment for programming and experimenting with 8051 microcontrollers.

Inside the box

- Development System: BIG8051
- CD: Product CD
- USB Cable
- 128x64 graphic LCD display
- 2x16 alphanumeric LCD display
- Piezo buzzer
- CAN
- ZigBee



Back of BIG8051 development system

System Specification

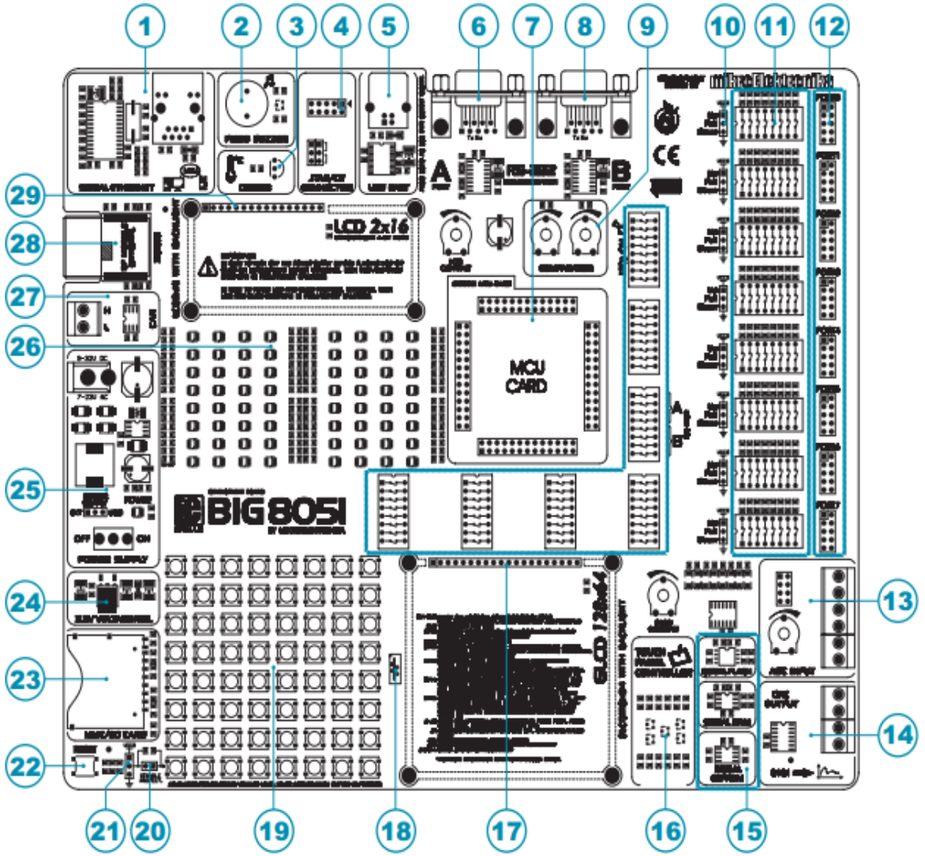
- **Power Supply:** over AC/DC connector / USB Cable (5V DC)
- **Power Consumption:** 50mA (with all modules off)
- **Dimensions:** 26.5 x 22 cm
- **Weight:** 420g

Features

- Full-featured development system for 8051
- Analog to digital conversion of voltage signal
- CAN communication module

Key Features

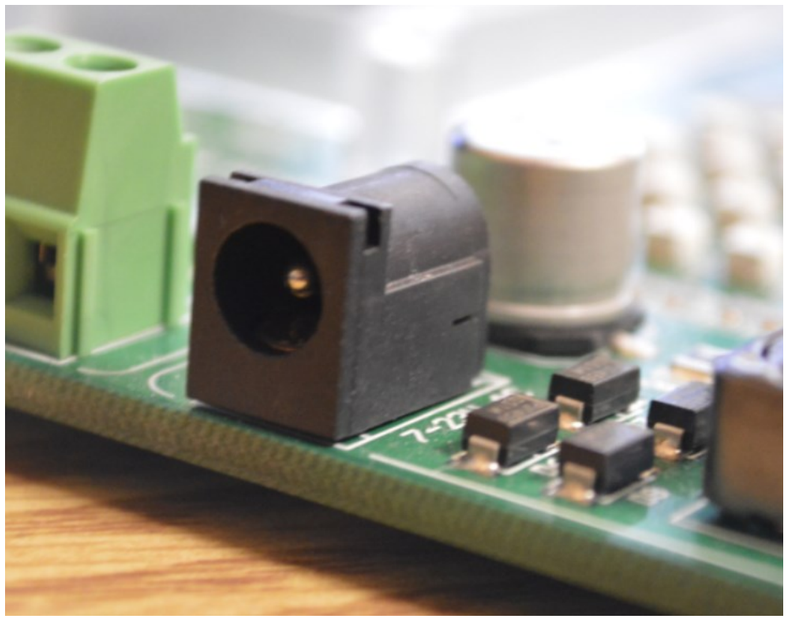
1. Ethernet module
2. Piezo buzzer
3. Connector for temperature sensor
4. Connector for programmer
5. USB UART module (USB power supply connector)
6. RS-232B module
7. Connector for MCU card
8. RS232B module
9. Comparator
10. Jumpers used to select pull-up/pull-down resistors
11. DIP switches used to turn on pull-up/pull-down resistors
12. I/O ports
13. A/D converter inputs
14. D/A converter outputs
15. Memory modules
16. Touch panel controller
17. Connector for GLCD display
18. Connector for touch panel
19. Push buttons
20. Jumper used to shorten protective resistor
21. Jumper used to select push buttons' logic state
22. Reset button
23. Connector for MMC/SD cards
24. 3.3 V voltage regulator
25. Power supply module
26. LEDs
27. CAN module
28. ZigBee module
29. Connector for LCD display



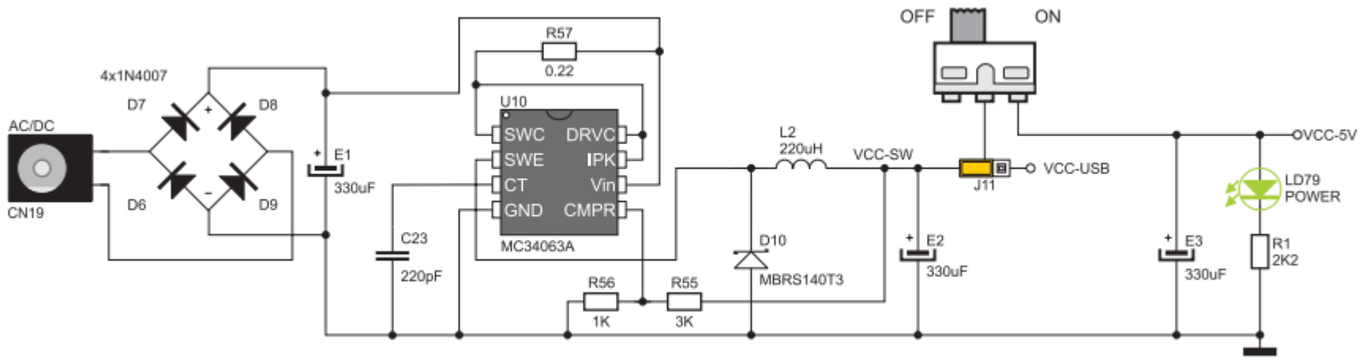
BIG8051 Board overview[1]

Connecting to power supply

To power the development system on, we have to provide power supply voltage over AC/DC connector CN18. Before you turn the system on, it is necessary to place jumper J11 in the EXT position. Next, set the switch marked POWER SUPPLY to the ON position. As soon as the development system now powers on, a green LED labelled POWER will automatically illuminate.



Power Supply connector



Power supply module connections schematic

C8051F040 microcontroller

The BIG8051 system has a 100-pin microcontroller C8051F040 in TQFP package. Today over fifty companies produce variations of the 8051. Several of these companies have over fifty variations of this system. To bring things into context, over 100 million 8051's are sold each year. Our microcontroller appears to be soldered on the MCU card.

Originally, 8051 belongs to the MCS-51 family of microcontrollers. MCS-51 was developed by Intel but other manufacturers are second sources of this family. The MCS-51, now commonly referred to as the 8051 is a Harvard architecture, consisting of physically separate storage and signal pathways for instructions and data. Today, most processors implement such separate signal pathways for performance reasons. The original MCS-51 featured 8-bit ALU, registers, and data busses. The following table shows the features of the MCS-51 and the BIG8051:

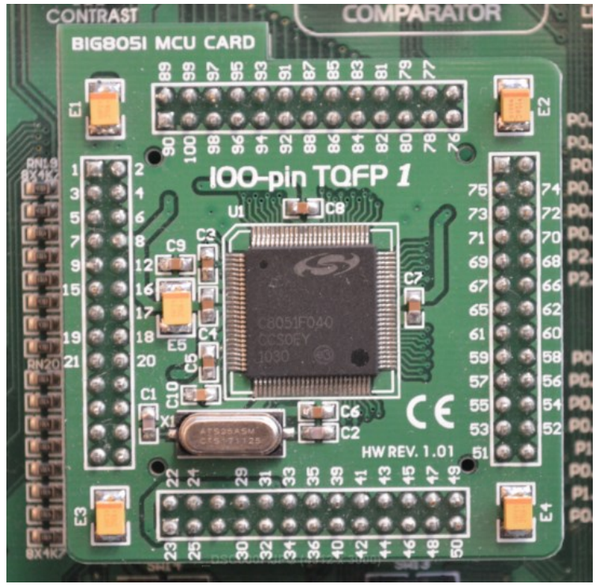
MCS-51

- 4K bytes internal ROM
- 128 bytes internal RAM
- Four 8-bit I/O ports
- Two 16-bit timers
- Serial interface
- 64K external code memory space
- 64K external data memory space
- 210 bit-addressable locations

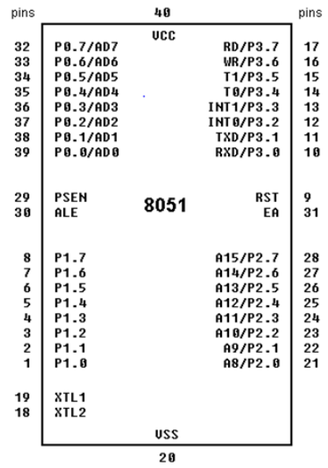
BIG8051

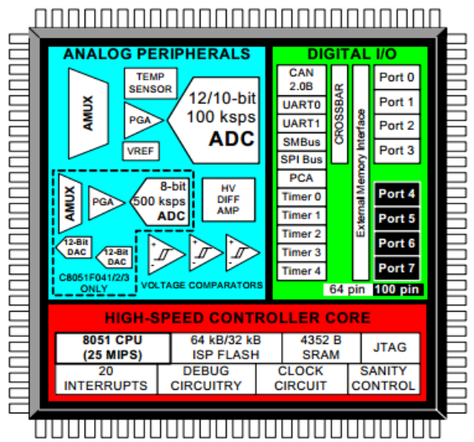
- Pipelined instruction architecture executes 70% of instruction set in 1 or 2 system clocks
- Up to 25 MIPS throughout with 25MHz clock
- 4352 bytes internal RAM
- 64kB Flash; in-system programmable 512-byte sectors
- BOSCH Controller Area Network (CAN 2.0B), hardware SMBus™ (I2C™ Compatible), SPI™, and two UART serial ports available concurrently
- Internal calibrated programmable oscillator: 3 to 24.5 MHz; etc.

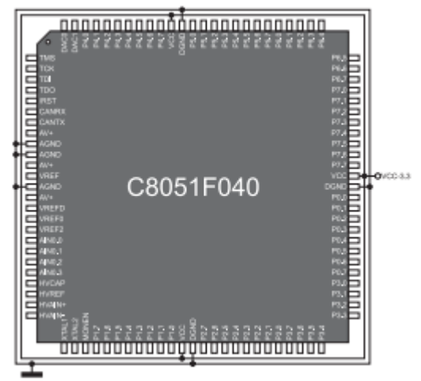
The microcontroller can be replaced with another one if desired, but it is important to make sure that they are compatible with the pinouts. "1-wire serial communication enables data to be transferred over one single communication line, while the process itself is under control of the *master* microcontroller. The advantage of this communication is that only one microcontroller pin is used. All *slave* devices have unique ID code, which enables the *master* device to easily identify all devices sharing the same communication bus



Microcontroller 8051F040







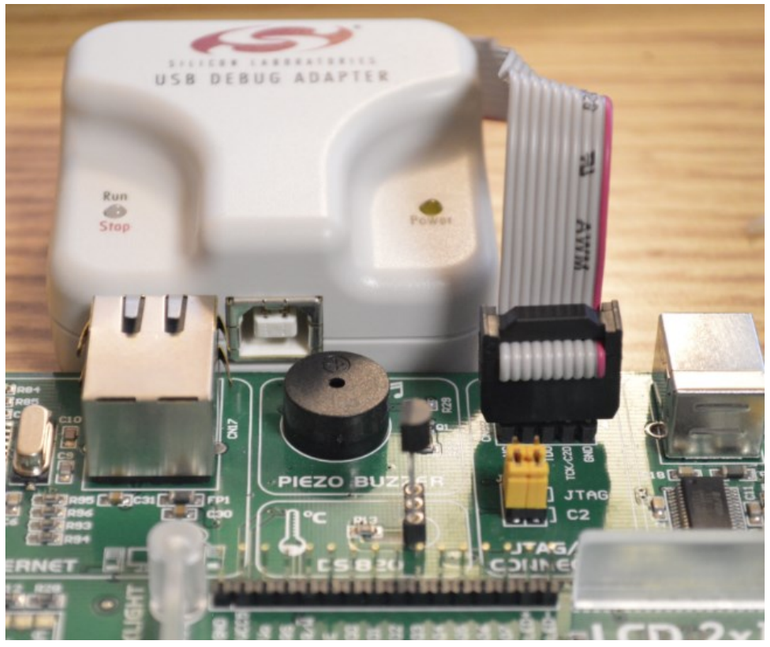
Pinout [3]

Programming microcontroller

The C8051F040 microcontroller must be programmed using a USB DEBUG ADAPTER which is provided with the box. It is always a good practice to make sure that the power is turned on, the USB DEBUG ADAPTER is connected to the development system through the cable as shown(CN23).

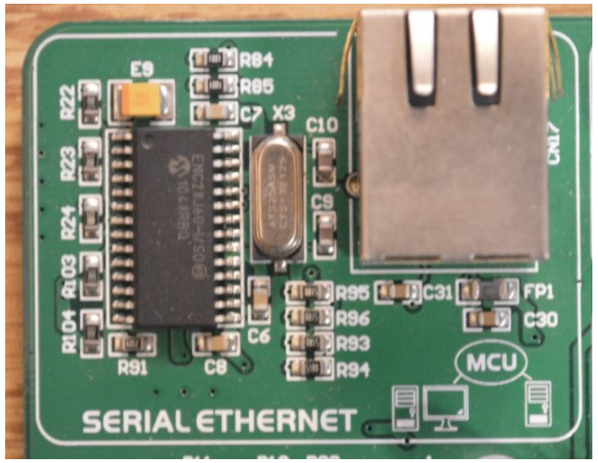
JTAG programmer USB DEBUG ADAPTER

Connector for programmer



Connecting JTAG Programmer

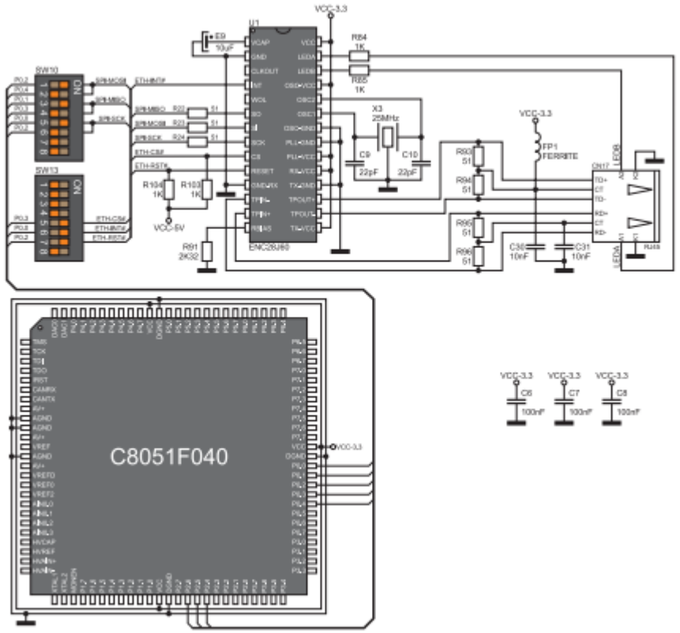
Ethernet module



Ethernet module

The Ethernet module lets us access the LAN network via the connector (RJ45). Using Serial Peripheral Interface, this module can communicate with the microcontroller.

Connecting Ethernet cable

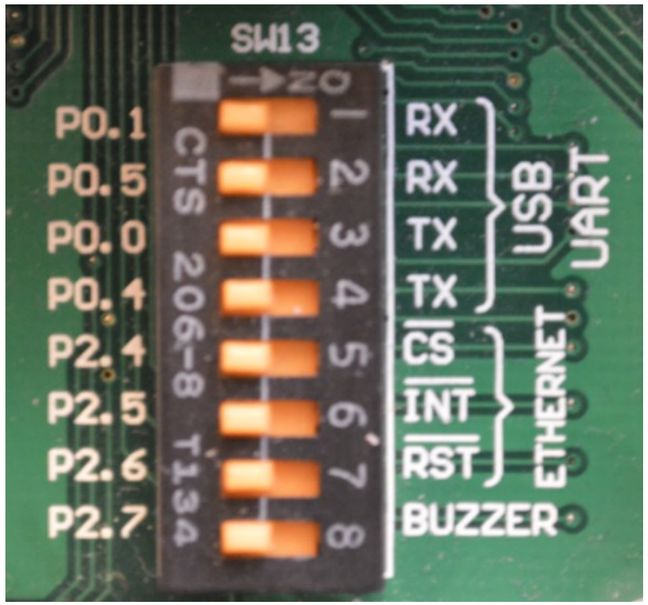


Ethernet module connection schematic [4]

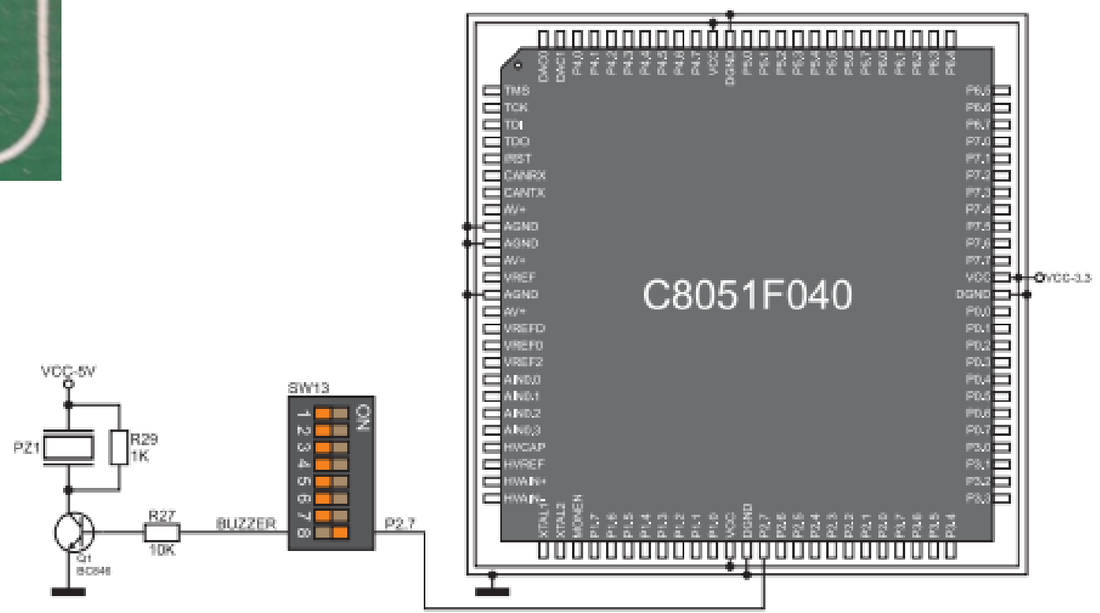
Piezo Buzzer

Piezo buzzers are used for making beeps, tones, and alerts. To use, one pin has to be connected to the ground (in schematic) and the other pin to a square wave out from a timer or microcontroller. For the loudest tones, stay around 4KHz. This buzzer gives the BIG8051 development system the ability to emit audio signals. Best performance for our Piezo buzzer can be achieved with frequencies between 2KHz and 4KHz. To make a connection between the piezo buzzer and the microcontroller, it is necessary to set switch 8 on the DIP switch SW13 to the ON position . The figure currently shows it in off position.

Piezo buzzer



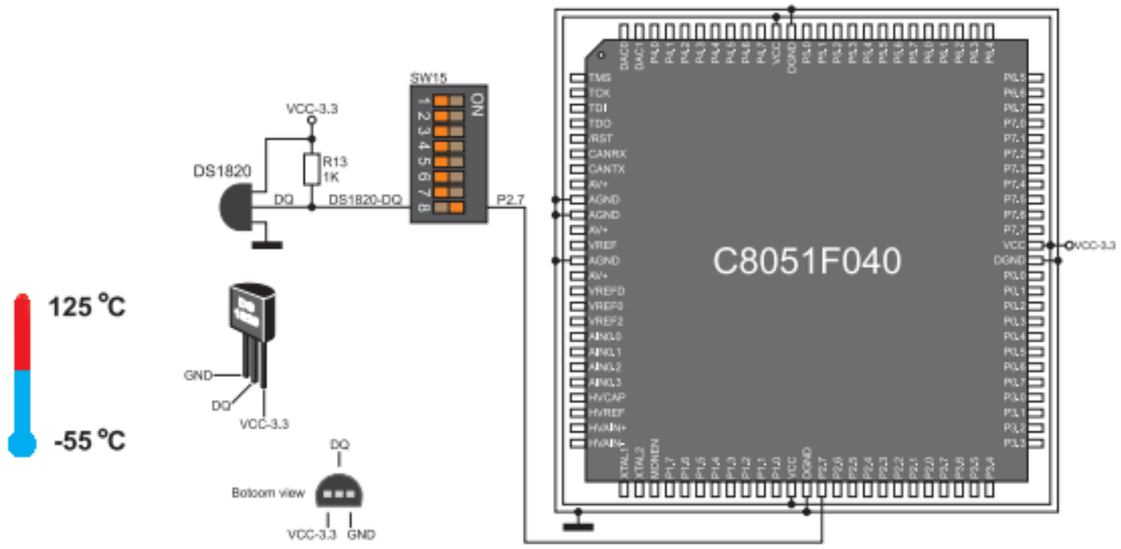
Piezo buzzer connected to the microcontroller



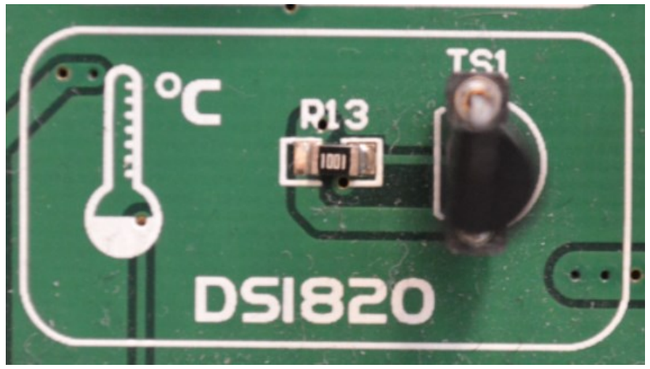
Piezo buzzer and connection schematic [5]

Temperature sensor

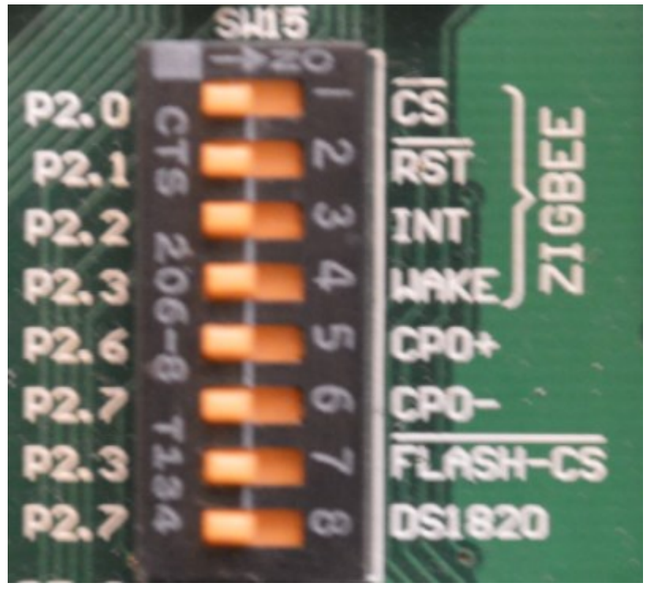
Our BIG8051 development system comes with a DS1820 temperature sensor that uses 1-wire communication as mentioned earlier. It can be used to measure temperature in the range between –55 degrees Celsius to 125 degree Celsius with an accuracy of +/-0.5 degrees Celsius. The sensor can convert temperature with 9-bit resolution and takes a maximum of 750ms. The communication between this module and the microcontroller is achieved via pin P2.7 as shown in the diagram. To establish a connection between them, it is necessary to set switch 8 on the DIP switch SW15 to the ON position.



DS1820 and microcontroller connection schematic [6]



DS1820 temperature sensor connected. Make sure that the rounded side of the DS1820 matches the half circle on board

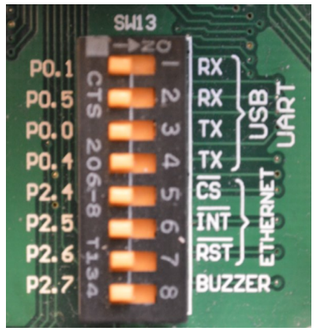


Switch 8 on the DIP switch SW15 is set to OFF at the moment. To connect DS1820, set pin P2.7 to ON

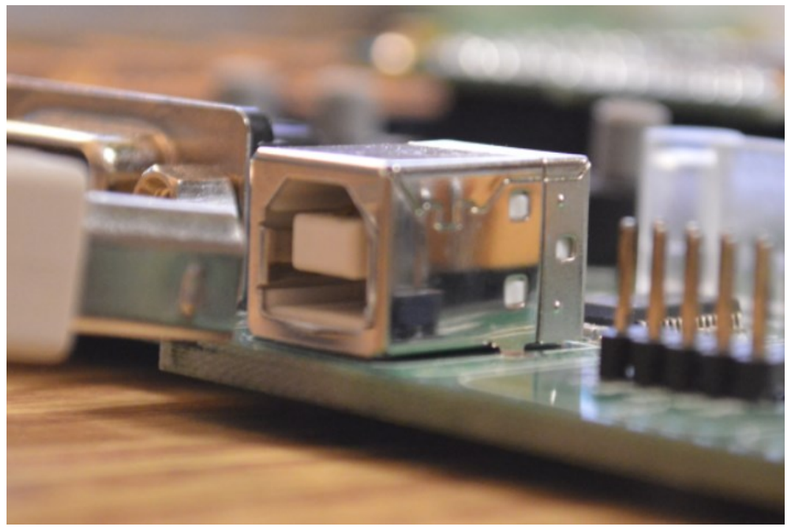
USB UART module

The USB UART module is used to connect the microcontroller to an external USB device. To establish connection between the microcontroller and the USB UART module, it is important to set switches 1 and 3 (optionally 2 and 4) to the ON position.

The BIG8051 can also use this module to power itself. To achieve this, it is necessary to set the switch position of jumper J11 (found on the power module) from EXT to USB.

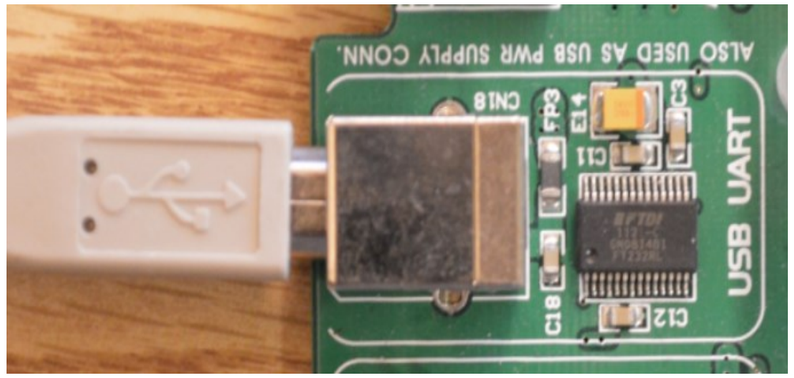


SW13



Connecting USB cable

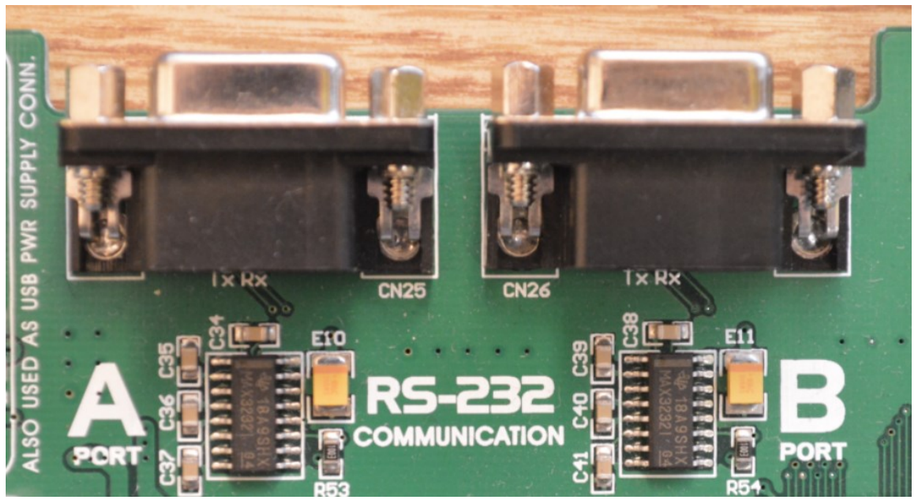
USB connector and microcontroller connection schematic [7]



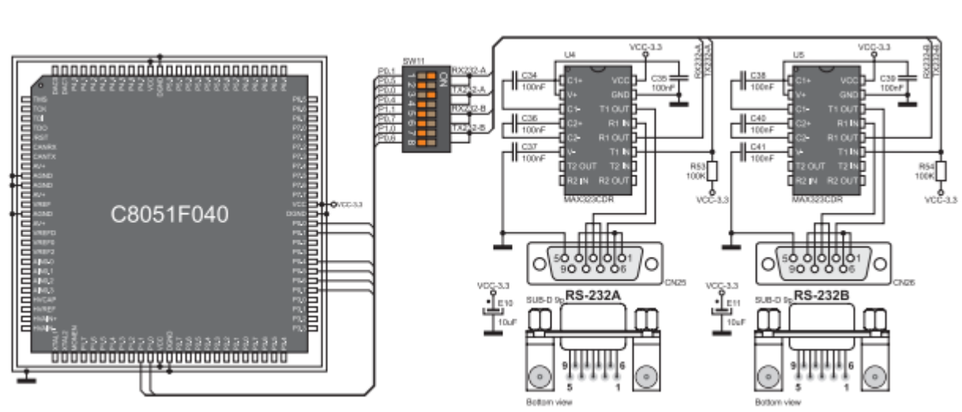
USB UART module

RS-232 modules

The RS-232 modules allow the development system to communicate to external devices in compliance with the RS-232 standard. The two RS modules in the BIG8051 can operate separately. To connect, switches 1 and 3 (optionally 2 and 4) on DIP switch SW11 should be set to the ON position.



RS-232 module



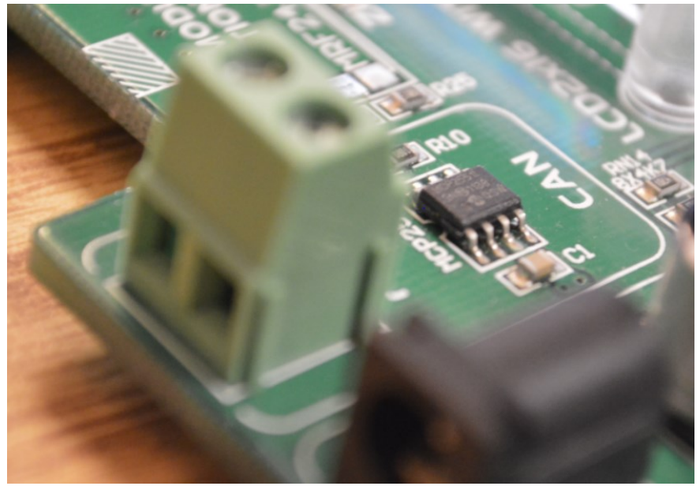
RS-232 module connection schematic [8]

CAN module

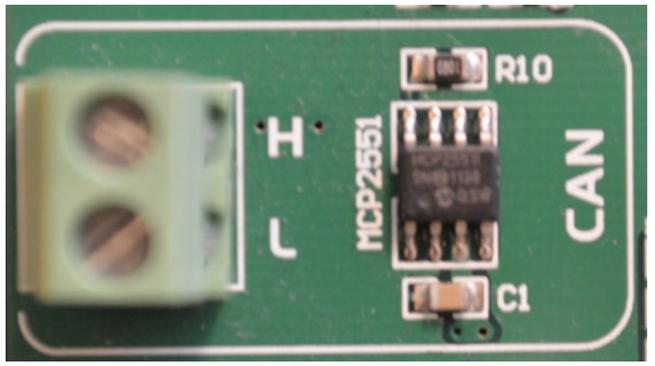
Controller Area Network (CAN) is a communication standard primarily intended for use in the automotive industry. It is used when microcontrollers and devices need to communicate with each other in applications without a host computer. The modern automobile may have as many as 70 electric control units for various subsystems. Typically the biggest processor is the engine control unit. Others are used for transmission, airbags, ABS, cruise control, electric power steering, audio systems, power windows, doors, mirrors, etc. Some of these form independent subsystems, but communications among others are essential. A subsystem may need to control actuators or receive feedback from sensors. The CAN standard was devised to fill this need.

Each CAN node is able to send and receive messages, but not simultaneously. The devices that are usually connected by a CAN network are typically sensors, actuators, and other control devices. The host processor decides what the received messages mean and what messages it wants to transmit. Sensors, actuators and control devices can be connected to the host processor. CAN controller stores the receives serial bits from the bus until an entire message is available, which can then be fetched by the host processer, usually by the CAN controller triggering an interrupt. For sending, the host processor sends the transmit messages to a CAN controller, which transmits the bits serially onto the bus when the bus is free.

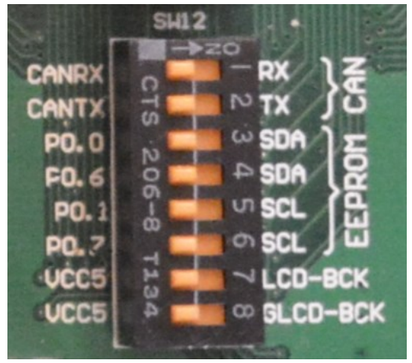
To establish connection between this module and the microcontroller, it is necessary to set the switches 1 and 2 on the DIP switch SW12 to the ON position.



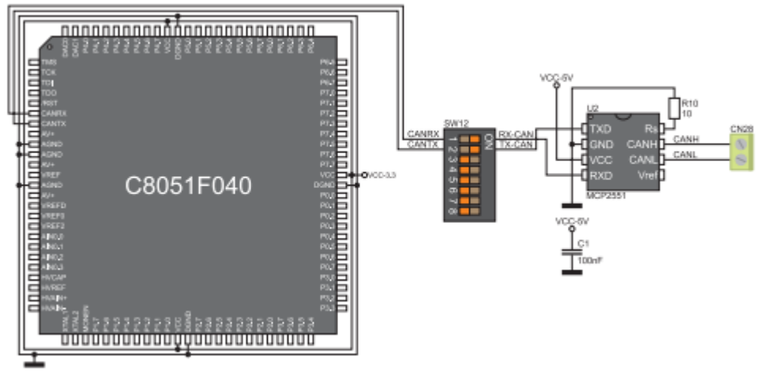
CAN module connector



CAN module



SW12



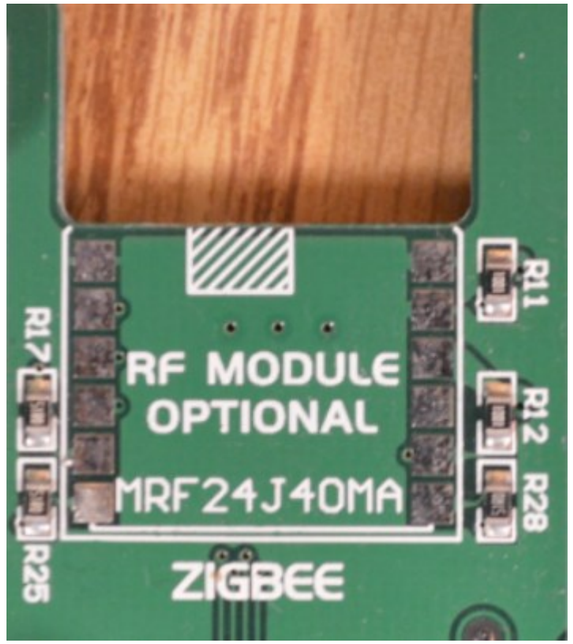
CAN module and microcontroller connection schematic [9]

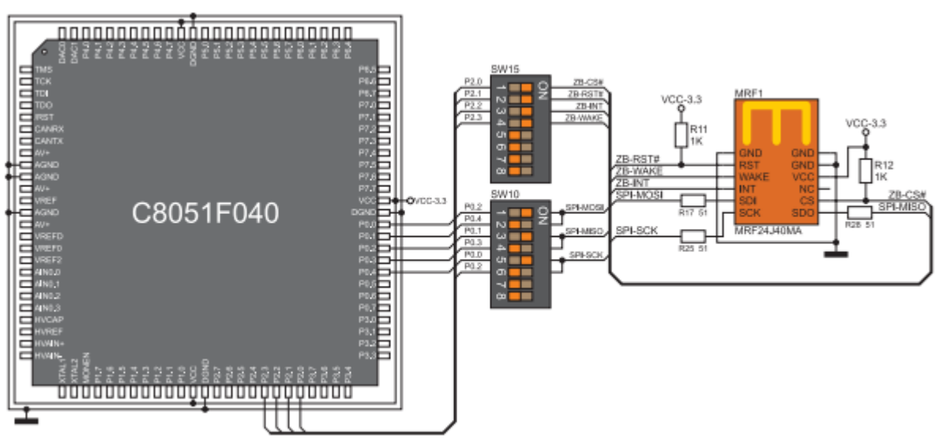
ZigBee module

The BIG805 enables you to connect the ZigBee module that is used for wireless communication. The module communicates with the microcontroller with the standard SPI protocols. It is necessary to set switches 1,3 and 5 on the DIP switch SW10, as well as the switches 1,2,3 and 4 on the DIP switch SW15 to the ON position for functionality.

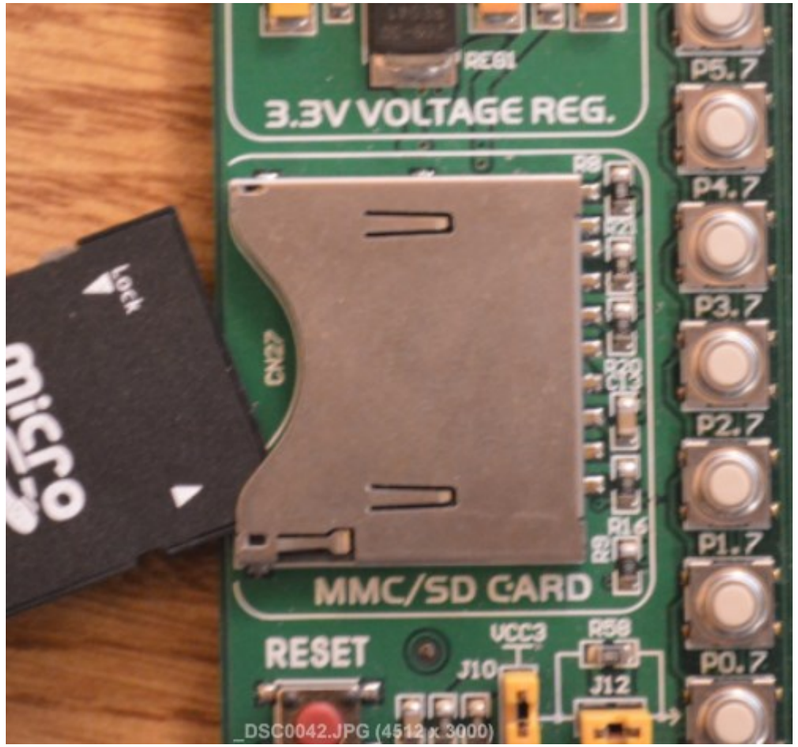
At the moment, our boards do not have any RF module attached to it. However, the MRF24J40MA ZigBee module can be connected to the development system. This module can be used as an ideal solution for wireless sensor networks, home automation, building automation, and consumer applications. The features of this particular radio transceiver module are:

- 2.4 GHz IEEE 8-2.15.4 Transceiver module supports ZigBee™, MiWi™, and MiWi P2P protocols
- Integrated PCB Antenna with simple four-wire SPI interface to PIC microcontroller
- Low current consumption

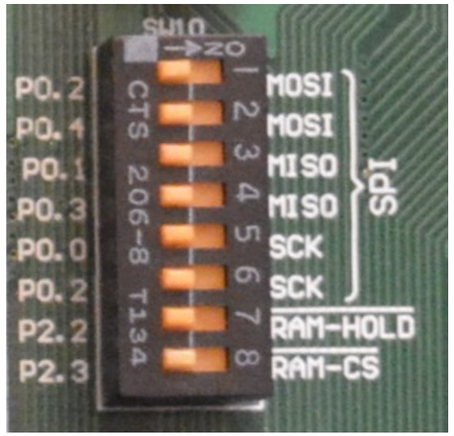


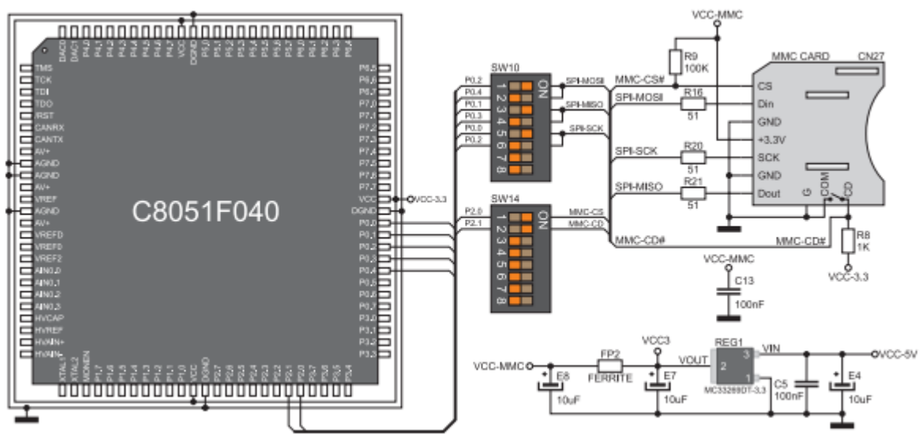


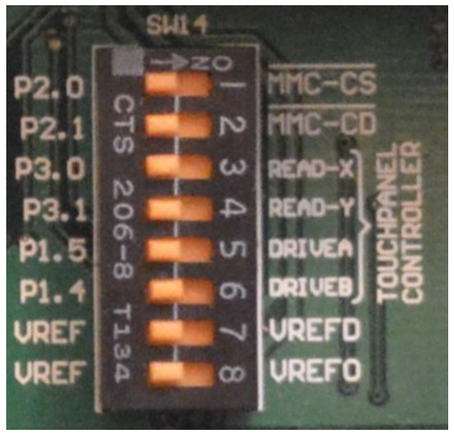
MMC/SD connector



The development system is able to read memory cards due to the on-board MMC/SD connector. The module uses microcontroller pins for serial communication. To connect this module, it is necessary to set switches 1,3 and 5 (optionally 2,4, and 6) on the DIP switch SW10, as well as switches 1 and 2 on the DIP switch SW14 to the ON position.

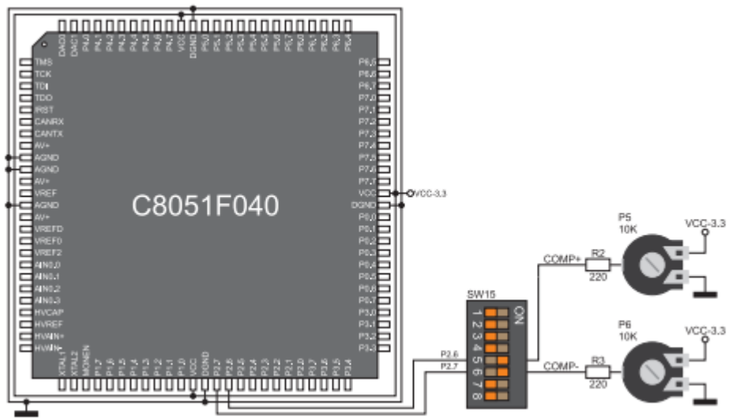


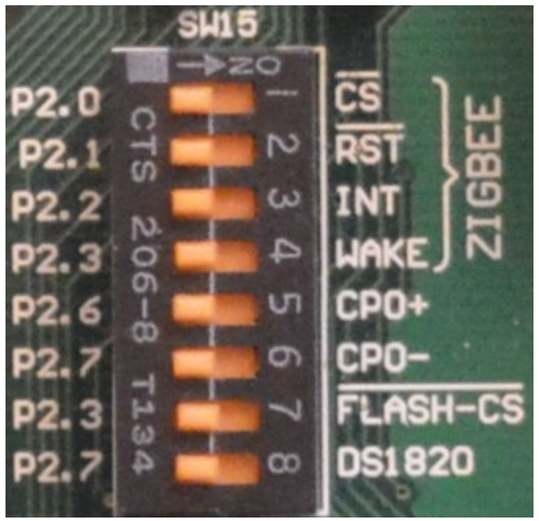




Comparator

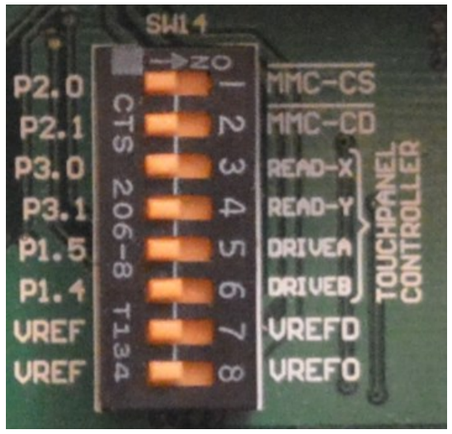
The BIG8051 can compare voltage levels due to a comparator built into the microcontroller. Voltage signals are supplied via potentiometers P5 and P6. To enable voltage signals, set switches 5 and 6 on DIP switch SW15 to the ON position.

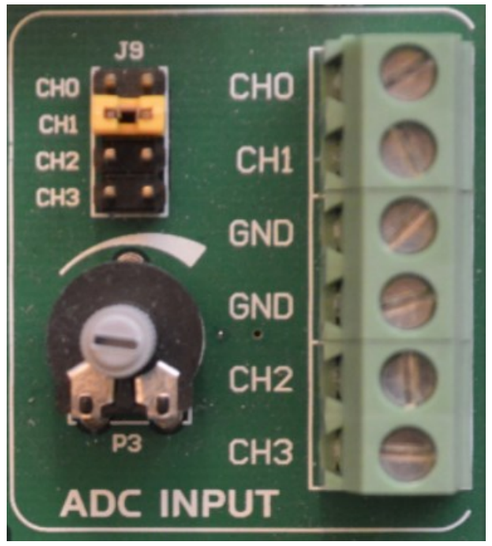


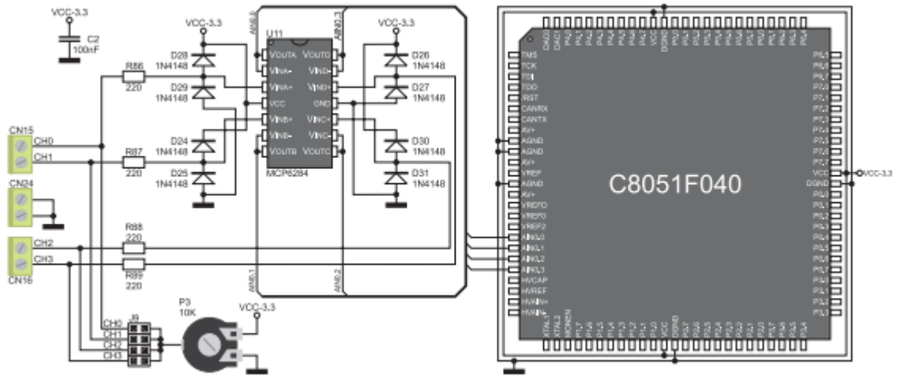


ADC module

The ADC module is used to convert an analog voltage level into the appropriate 12-bit digital value. The analog voltage signal is supplied via screw terminals CH0, CH1, CH2, and CH3. The ADC module is built-in into the microcontroller. The voltage supplied from the VREF pin is used as a voltage reference. In order to use this voltage, switch 8 on the DIP SW14 should be set to the ON position.

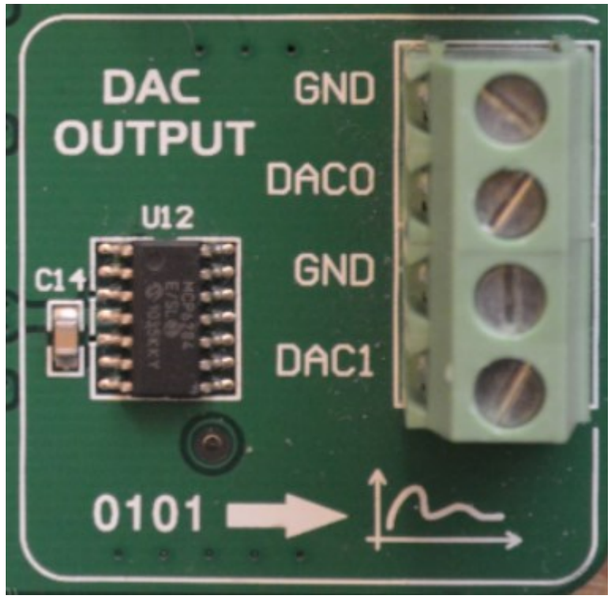


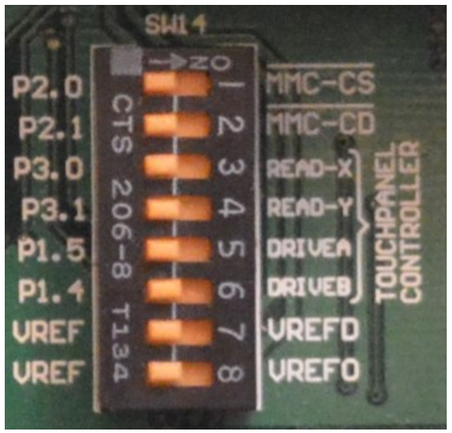


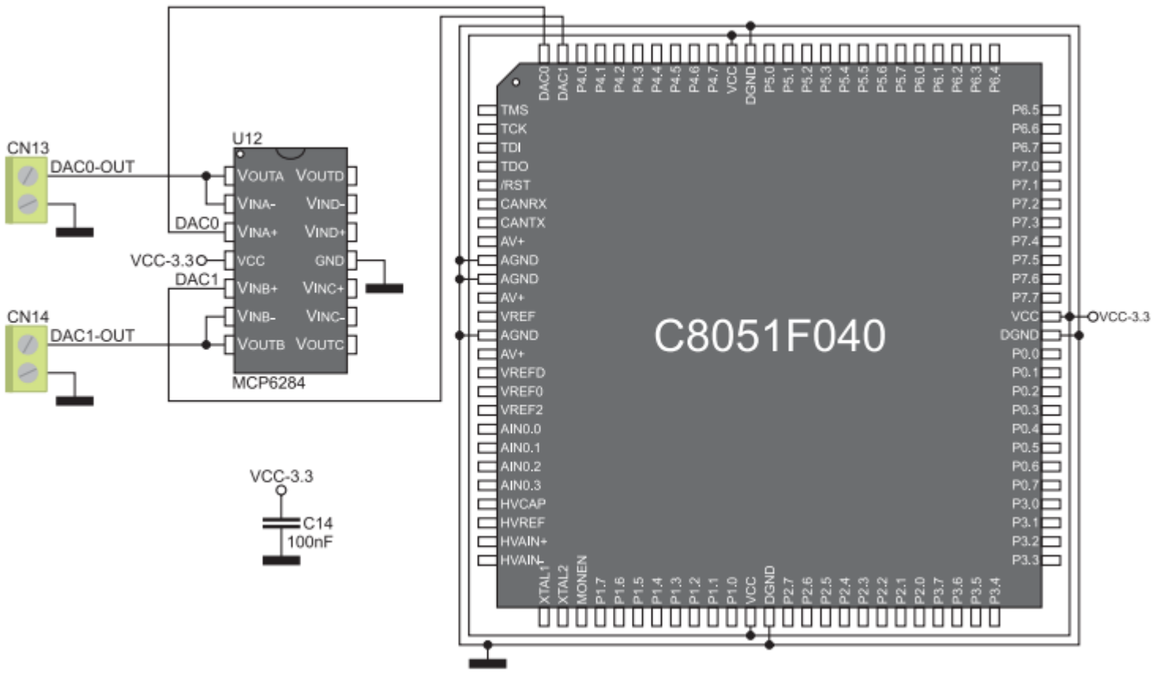


DAC module

. The DAC module attached to the development system can be used to convert 12-bit digital values into appropriate analog voltage values. The output analog voltage signals is delivered via screw terminals DAC0, and DAC1. Like the ADC module, this module also uses the VREF pin on the microcontroller as a voltage reference. To use this voltage, switch 7 on DIP switch SW14 should be set to the ON position.







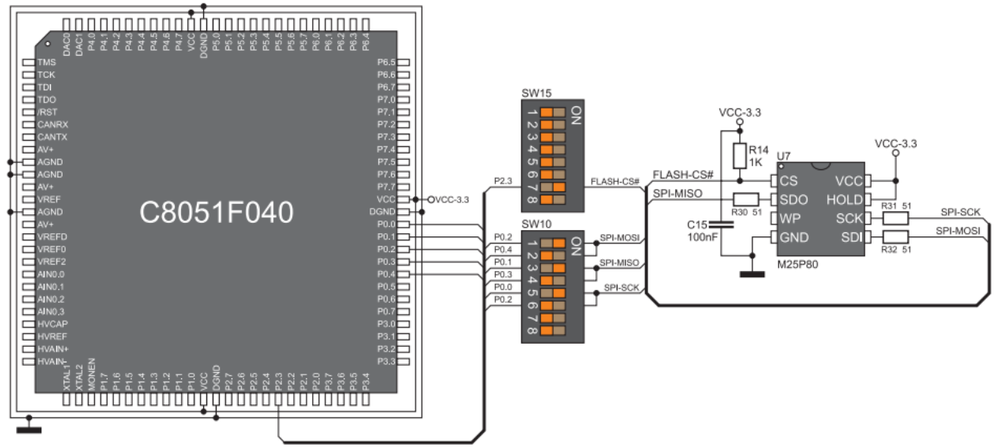
Memory modules

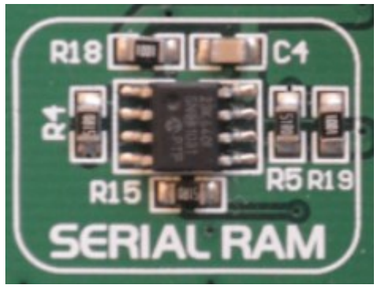
The BIG8051 comes with Flash, RAM and EEPROM memory modules. This allows the microcontroller to expand its memory space.

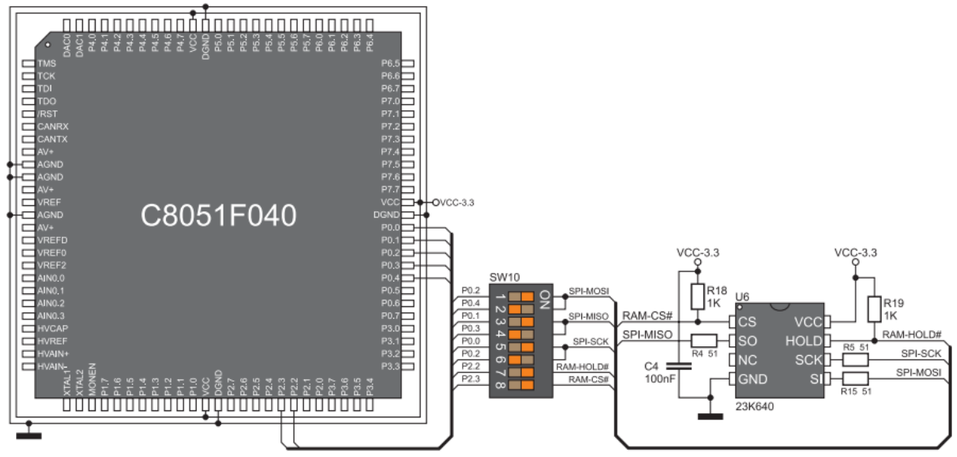
The Flash module lets the microcontroller to use an additional 8Mbit flash memory via SPI. To establish connection between the Flash module and the microcontroller, switches 1, 3, and 5 (optionally 2, 4, and 6) on the DIP switch SW10, as well as switch 7 on the DIP switch SW15 to the ON position.

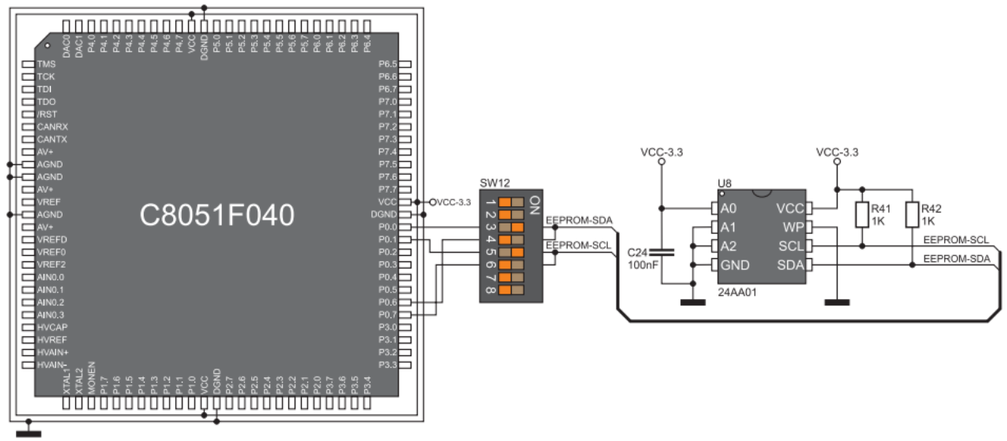
The RAM module enables the microcontroller to use an additional 64Kbit RAM memory via SPI. To enable this connection between the module and the microcontroller, it is necessary to set switches 1,3,5,7 and 8 (optionally 2,4,6) on the DIP switch SW10 to the ON position.

EEPROM module enables the microcontroller to use an additional 1Kbit EEPROM memory via I2C serial connection. Set switches 3 and 5 (optionally 4 and 6) on the DIP switch SW12 to the ON position.





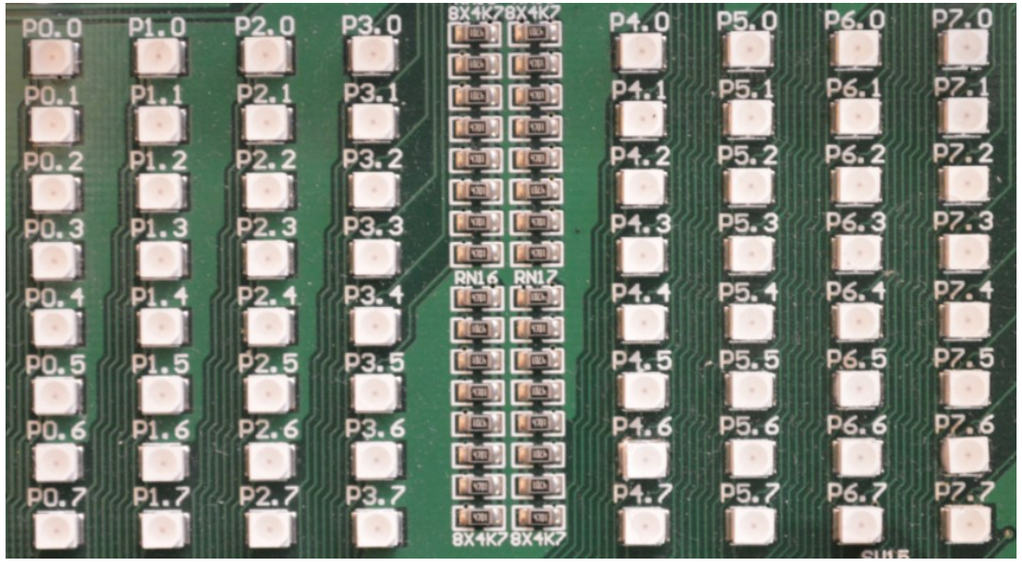


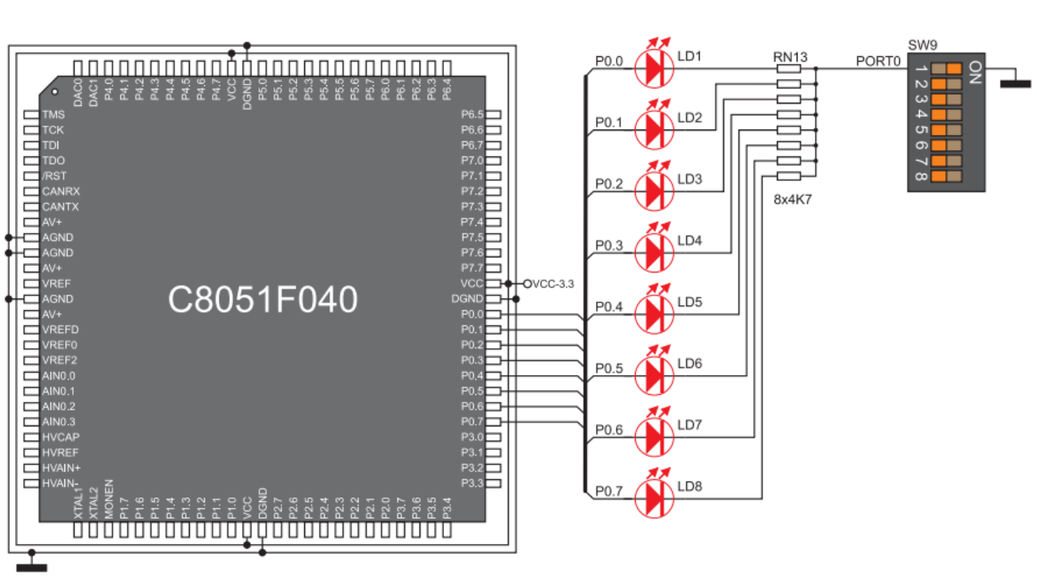


LEDs

There are a total of 64 LEDs on the development board and can be used to visually indicate the state of each microcontroller I/O pin. When active, an LED indicates that a logic 1 is present on that particular pin. To enable LEDs to illuminate, it is necessary to select the appropriate port using DIP switch SW9.

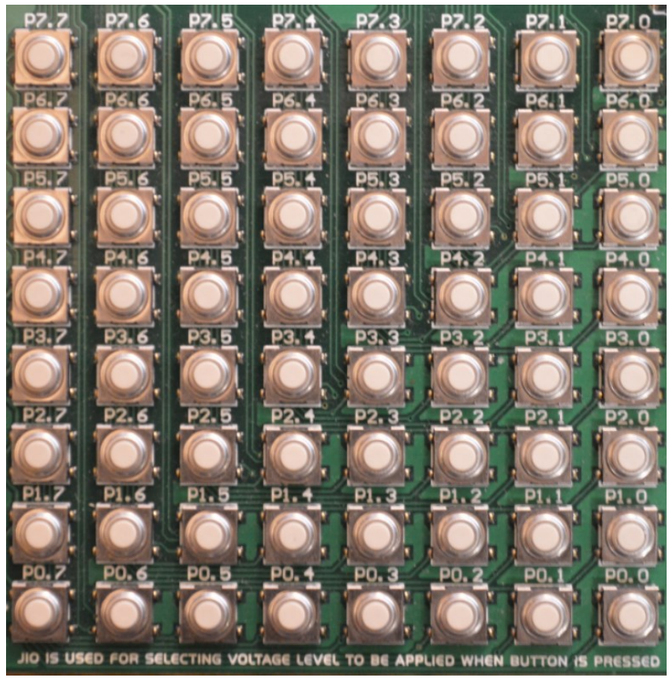
There are 8 available ports labelled PORT0 through PORT7.

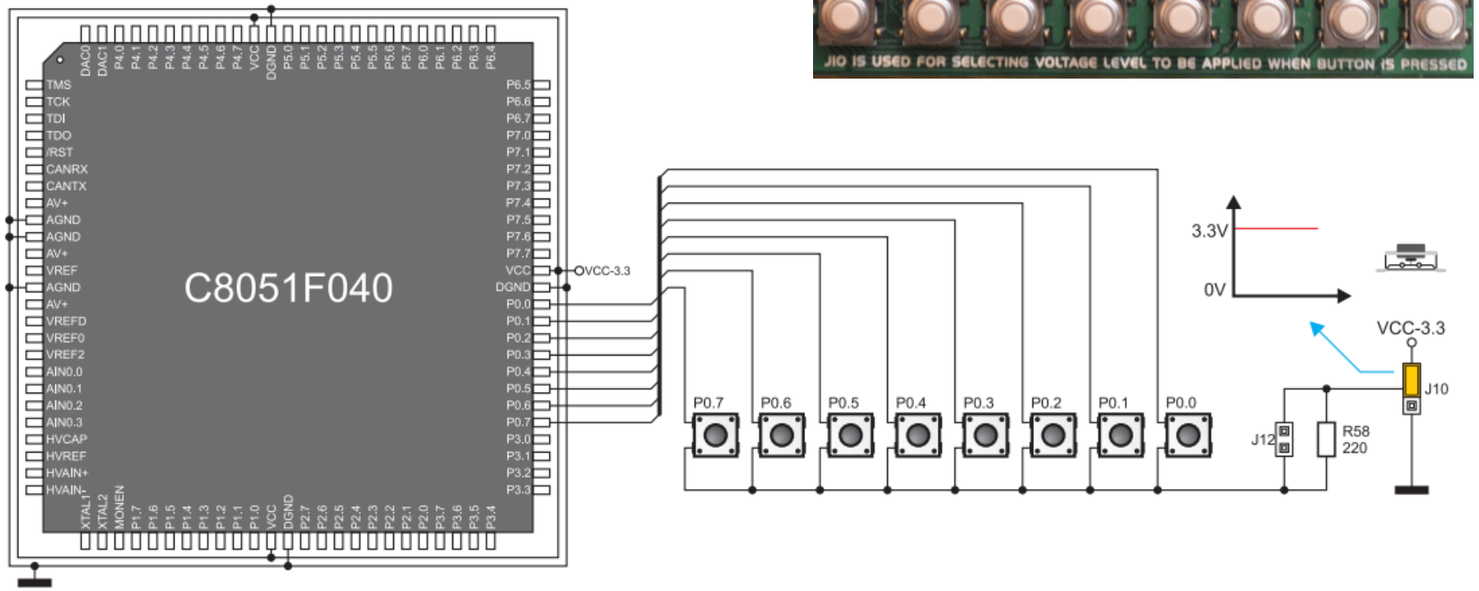




Push buttons

The provided push buttons on the development board can be used to change the logic state of all the microcontroller input pins. Jumper J10 is used to determine the logic state to be supplied on the appropriate microcontroller pin by pressing a push button. On the lower left side of the push buttons, a RESET button can be found to reset the micro-controller.

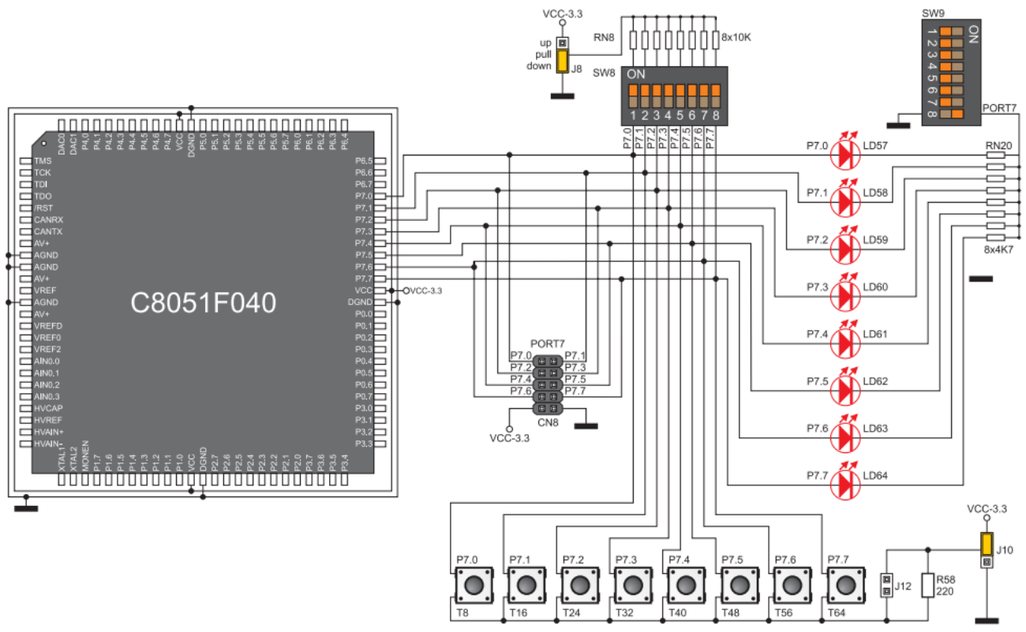


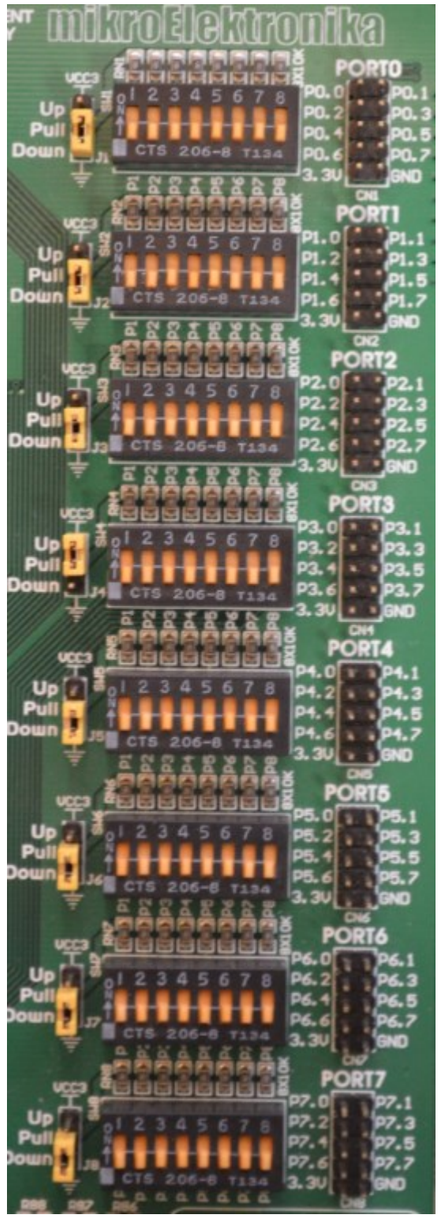


Input / Output ports

The BIG8051 has 10-pin connectors lined to the microcontroller I/O ports. Due to DIP switches SW1-SW8, every connector pin can be connected to one pull-up/pull-down resistor. It depends on the position of jumpers J1-J8 to control this aspect.

The pull-up resistor ensures that the signal will be a valid logic level if external devices are connected. A pull up resistor weakly “pulls” the voltage of the wire it is connected to towards its voltage source level when the other components on the line are inactive. A pull-down resistor works the same way but is connected to ground. It holds the logic signal near zero volts when no other device is connected.





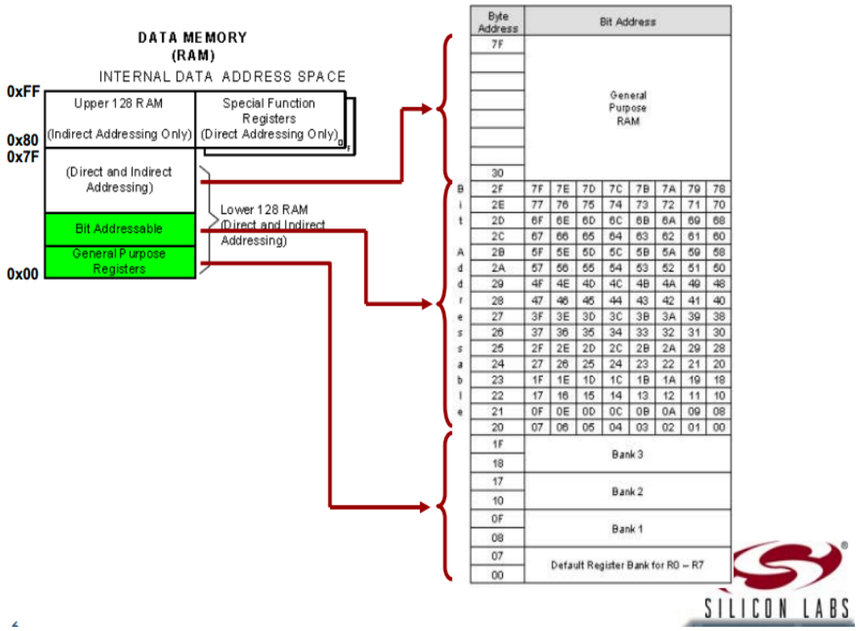
8051 Assembly Introduction

A computer instruction is made up of an operation code (op-code) followed by either zero, one, or two bytes of operands.

The op-code identifies the type of operation to be performed while the operands identify the source and destination of the data

If the instruction is associated with more than one operand, the format is always:

Instruction Destination, Source


DATA MEMORY
(RAM)
INTERNAL DATA ADDRESS SPACE
0xFF
0x80
0x7F
0x00
Upper 128 RAM
(Indirect Addressing Only)
Special Function Registers
(Direct Addressing Only)
(Direct and Indirect Addressing)
Bit Addressable
General Purpose Registers
Lower 128 RAM
(Direct and Indirect Addressing)
Byte Address
Bit Address
7F
General Purpose RAM
30
2F 7F 7E 7D 7C 7B 7A 79 78
2E 77 76 75 74 73 72 71 70
2D 6F 6E 6D 6C 6B 6A 69 68
2C 67 66 65 64 63 62 61 60
2B 5F 5E 5D 5C 5B 5A 59 58
2A 57 56 55 54 53 52 51 50
29 4F 4E 4D 4C 4B 4A 49 48
28 47 46 45 44 43 42 41 40
27 3F 3E 3D 3C 3B 3A 39 38
26 37 36 35 34 33 32 31 30
25 2F 2E 2D 2C 2B 2A 29 28
24 27 26 25 24 23 22 21 20
23 1F 1E 1D 1C 1B 1A 19 18
22 17 16 15 14 13 12 11 10
21 0F 0E 0D 0C 0B 0A 09 08
20 07 06 05 04 03 02 01 00
Bit Addressable
Addressable
1F
18
Bank 3
17
10
Bank 2
0F
08
Bank 1
07
00
Default Register Bank for R0 – R7

The memory map of the C8051 if the lower data RAM area. Addresses 0x00 through 0X1F are banked registers R0-R7. The active bank is controlled via bits in the Program Status Word. From the PSW, we can conclude that the bit addressable memory located from 0x20 through 0x2F which provides 128 bits of bit addressable memory. The upper portion is used general purpose RAM ad can be accessed by any addressing mode (direct or indirect)

Special function registers (SFRs) have been added to the C8051 to that of the standard 8051 for enhanced peripherals. Upper data memory and SFR memory share the same address space but are accessed via different addressing modes (direct vs. indirect). The SFR portion can be accessed via ***direct addressing*** only.

There are eight modes of addressing available on the C805. The different addressing modes determine how the operand byte mentioned earlier to be selected.

Addressing Modes	Instruction
Register	MOV A, B
Direct	MOV 30H,A
Indirect	ADD A,@R0
Immediate Constant	ADD A,#80H
Relative*	SJMP +127/-128 of PC
Absolute*	AJMP within 2K
Long*	LJMP FAR
Indexed	MOVC A,@A+PC

The direct and indirect addressing modes are used to distinguish between the SFR space and data memory space.

Register Addressing

In CPU registers are used to store information temporarily. That information can be in the form of bytes of data to be processed or some address pointing to a data to be fetched. In 8051 there is only one data type: 8 bits. With an 8 bit data registers, any data more than 8-bit should be divided into 8 bit chunks before being processed.

The most widely used registers of 8051 are A (accumulator), R0, R1, R2, R3, R4, R5, R6, R7, DPTR (data pointer), PC (program counter). A register is used for all arithmetic and logic operations. These registers are divided into two groups:

- General purpose registers
- Special purpose registers

The register addressing instruction involves information transfer between registers

Example:

```
MOV     R0, A
MOV     A,#51H
MOV     R1,#0FFH
MOV     R2, #3BH
```

The first instruction above transfers the accumulator content into the R0 register. The register bank (Bank 0,1,2 or 3) must be specified prior to this instruction.

⇒ # signifies that it is a number and not a byte address
⇒ 'H' symbolizes that it is a hexadecimal number. Similarly if we write a binary number it should end with 'B'
⇒ The '0' in the third instruction in 0FFH symbolizes that the 'F' is a hex number and not a letter. This is always necessary if we are writing any hex numbers. It should always start with a 0.
⇒ All the register should be assumed to be of 1 byte unless otherwise mentioned.

Now to transfer contents of R1 to lets say, R6, the following code should do the trick:

```
MOV     R6,R1 ; copy contents of R1 to T6
```

DIRECT ADDRESSING:

This mode allows you to specify the operand by giving its actual memory address (typically specified in hex format) or by giving its abbreviated name. It is also used for SFR accesses.

INDIRECT ADDRESSING:

In the indirect addressing mode, a register is used to hold the effective address of the operand. This register, which holds the address, is called the pointer register and is said to point to the operand. Only registers R0, R1 and DPTR can be used as pointer registers. DPTR is useful in accessing operands which are in the external memory.

The 8051 microcontroller instructions are divided among five functional groups

1. Arithmetic
2. Logical
3. Data transfer
4. Boolean variable
5. Program branching

Instruction Set Sum-

Mnemonic	Description	Bytes	Clock Cycles
Arithmetic Operations			
ADD A, Rn	Add register to A	1	1
ADD A, direct	Add direct byte to A	2	2
ADD A, @Ri	Add indirect RAM to A	1	2
ADD A, #data	Add immediate to A	2	2
ADDC A, Rn	Add register to A with carry	1	1
ADDC A, direct	Add direct byte to A with carry	2	2
ADDC A, @Ri	Add indirect RAM to A with carry	1	2
ADDC A, #data	Add immediate to A with carry	2	2
SUBB A, Rn	Subtract register from A with borrow	1	1
SUBB A, direct	Subtract direct byte from A with borrow	2	2
SUBB A, @Ri	Subtract indirect RAM from A with borrow	1	2
SUBB A, #data	Subtract immediate from A with borrow	2	2
INC A	Increment A	1	1
INC Rn	Increment register	1	1
INC direct	Increment direct byte	2	2
INC @Ri	Increment indirect RAM	1	2
DEC A	Decrement A	1	1
DEC Rn	Decrement register	1	1
DEC direct	Decrement direct byte	2	2
DEC @Ri	Decrement indirect RAM	1	2
INC DPTR	Increment Data Pointer	1	1
MUL AB	Multiply A and B	1	4
DIV AB	Divide A by B	1	8
DA A	Decimal adjust A	1	1
Logical Operations			
ANL A, Rn	AND Register to A	1	1
ANL A, direct	AND direct byte to A	2	2
ANL A, @Ri	AND indirect RAM to A	1	2
ANL A, #data	AND immediate to A	2	2
ANL direct, A	AND A to direct byte	2	2
ANL direct, #data	AND immediate to direct byte	3	3
ORL A, Rn	OR Register to A	1	1
ORL A, direct	OR direct byte to A	2	2
ORL A, @Ri	OR indirect RAM to A	1	2
ORL A, #data	OR immediate to A	2	2
ORL direct, A	OR A to direct byte	2	2
ORL direct, #data	OR immediate to direct byte	3	3
XRL A, Rn	Exclusive-OR Register to A	1	1
XRL A, direct	Exclusive-OR direct byte to A	2	2
XRL A, @Ri	Exclusive-OR indirect RAM to A	1	2
XRL A, #data	Exclusive-OR immediate to A	2	2
XRL direct, A	Exclusive-OR A to direct byte	2	2
XRL direct, #data	Exclusive-OR immediate to direct byte	3	3
CLR A	Clear A	1	1
CPL A	Complement A	1	1
RL A	Rotate A left	1	1
RLC A	Rotate A left through Carry	1	1
RR A	Rotate A right	1	1
RRC A	Rotate A right through Carry	1	1
SWAP A	Swap nibbles of A	1	1

Instruction Set Summary (cont.)

Data Transfer			
MOV A, Rn	Move Register to A	1	1
MOV A, direct	Move direct byte to A	2	2
MOV A, @Ri	Move indirect RAM to A	1	2
MOV A, #data	Move immediate to A	2	2
MOV Rn, A	Move A to Register	1	1
MOV Rn, direct	Move direct byte to Register	2	2
MOV Rn, #data	Move immediate to Register	2	2
MOV direct, A	Move A to direct byte	2	2
MOV direct, Rn	Move Register to direct byte	2	2
MOV direct, direct	Move direct byte to direct byte	3	3
MOV direct, @Ri	Move indirect RAM to direct byte	2	2
MOV direct, #data	Move immediate to direct byte	3	3
MOV @Ri, A	Move A to indirect RAM	1	2
MOV @Ri, direct	Move direct byte to indirect RAM	2	2
MOV @Ri, #data	Move immediate to indirect RAM	2	2
MOV DPTR, #data16	Load DPTR with 16-bit constant	3	3
MOVC A, @A+DPTR	Move code byte relative DPTR to A	1	3
MOVC A, @A+PC	Move code byte relative PC to A	1	3
MOVX A, @Ri	Move external data (8-bit address) to A	1	3
MOVX @Ri, A	Move A to external data (8-bit address)	1	3
MOVX A, @DPTR	Move external data (16-bit address) to A	1	3
MOVX @DPTR, A	Move A to external data (16-bit address)	1	3
PUSH direct	Push direct byte onto stack	2	2
POP direct	Pop direct byte from stack	2	2
XCH A, Rn	Exchange Register with A	1	1
XCH A, direct	Exchange direct byte with A	2	2
XCH A, @Ri	Exchange indirect RAM with A	1	2
XCHD A, @Ri	Exchange low nibble of indirect RAM with A	1	2

Boolean Manipulation			
CLR C	Clear Carry	1	1
CLR bit	Clear direct bit	2	2
SETB C	Set Carry	1	1
SETB bit	Set direct bit	2	2
CPL C	Complement Carry	1	1
CPL bit	Complement direct bit	2	2
ANL C, bit	AND direct bit to Carry	2	2
ANL C, /bit	AND complement of direct bit to Carry	2	2
ORL C, bit	OR direct bit to carry	2	2
ORL C, /bit	OR complement of direct bit to Carry	2	2
MOV C, bit	Move direct bit to Carry	2	2
MOV bit, C	Move Carry to direct bit	2	2
JC rel	Jump if Carry is set	2	2/3
JNC rel	Jump if Carry is not set	2	2/3
JB bit, rel	Jump if direct bit is set	3	3/4
JNB bit, rel	Jump if direct bit is not set	3	3/4
JBC bit, rel	Jump if direct bit is set and clear bit	3	3/4
Program Branching			
ACALL addr11	Absolute subroutine call	2	3
LCALL addr16	Long subroutine call	3	4
RET	Return from subroutine	1	5
RETI	Return from interrupt	1	5
AJMP addr11	Absolute jump	2	3
LJMP addr16	Long jump	3	4
SJMP rel	Short jump (relative address)	2	3
JMP @A+DPTR	Jump indirect relative to DPTR	1	3
JZ rel	Jump if A equals zero	2	2/3
JNZ rel	Jump if A does not equal zero	2	2/3
CJNE A, direct, rel	Compare direct byte to A and jump if not equal	3	3/4
CJNE A, #data, rel	Compare immediate to A and jump if not equal	3	3/4
CJNE Rn, #data, rel	Compare immediate to Register and jump if not equal	3	3/4
CJNE @Ri, #data, rel	Compare immediate to indirect and jump if not equal	3	4/5
DJNZ Rn, rel	Decrement Register and jump if not zero	2	2/3
DJNZ direct, rel	Decrement direct byte and jump if not zero	3	3/4
NOP	No operation	1	1

Instructions by opcode

	00	01	02	03	04	05	06	07	08	09	0A	0B	0C	0D	0E	0F
00	NOP	AJMP	LJMP	RR	INC	INC	INC	INC	INC	INC	INC	INC	INC	INC	INC	INC
10	JBC	ACALL	LCALL	RRC	DEC	DEC	DEC	DEC	DEC	DEC	DEC	DEC	DEC	DEC	DEC	DEC
20	JB	AJMP	RET	RL	ADD	ADD	ADD	ADD	ADD	ADD	ADD	ADD	ADD	ADD	ADD	ADD
30	JNB	ACALL	RETI	RLC	ADDC	ADDC	ADDC	ADDC	ADDC	ADDC	ADDC	ADDC	ADDC	ADDC	ADDC	ADDC
40	JC	AJMP	ORL	ORL	ORL	ORL	ORL	ORL	ORL	ORL	ORL	ORL	ORL	ORL	ORL	ORL
50	JNC	ACALL	ANL	ANL	ANL	ANL	ANL	ANL	ANL	ANL	ANL	ANL	ANL	ANL	ANL	ANL
60	JZ	AJMP	XRL	XRL	XRL	XRL	XRL	XRL	XRL	XRL	XRL	XRL	XRL	XRL	XRL	XRL
70	JNZ	ACALL	ORL	JMP	MOV	MOV	MOV	MOV	MOV	MOV	MOV	MOV	MOV	MOV	MOV	MOV
80	SJMP	AJMP	ANL	MOVC	DIV	MOV	MOV	MOV	MOV	MOV	MOV	MOV	MOV	MOV	MOV	MOV
90	MOV	ACALL	MOV	MOVC	SUBB	SUBB	SUBB	SUBB	SUBB	SUBB	SUBB	SUBB	SUBB	SUBB	SUBB	SUBB
A0	ORL	AJMP	MOV	INC	MUL	===	MOV	MOV	MOV	MOV	MOV	MOV	MOV	MOV	MOV	MOV
B0	ANL	ACALL	CPL	CPL	CJNE	CJNE	CJNE	CJNE	CJNE	CJNE	CJNE	CJNE	CJNE	CJNE	CJNE	CJNE
C0	PUSH	AJMP	CLR	CLR	SWAP	XCH	XCH	XCH	XCH	XCH	XCH	XCH	XCH	XCH	XCH	XCH
D0	POP	ACALL	SETB	SETB	DA	DJNZ	XCHD	XCHD	DJNZ	DJNZ	DJNZ	DJNZ	DJNZ	DJNZ	DJNZ	DJNZ
E0	MOVX	AJMP	MOVX	MOVX	CLR	MOV	MOV	MOV	MOV	MOV	MOV	MOV	MOV	MOV	MOV	MOV
F0	MOVX	ACALL	MOVX	MOVX	CPL	MOV	MOV	MOV	MOV	MOV	MOV	MOV	MOV	MOV	MOV	MOV

Writing your first program

- Download Silicon Laboratories IDE. Follow the link for the download:

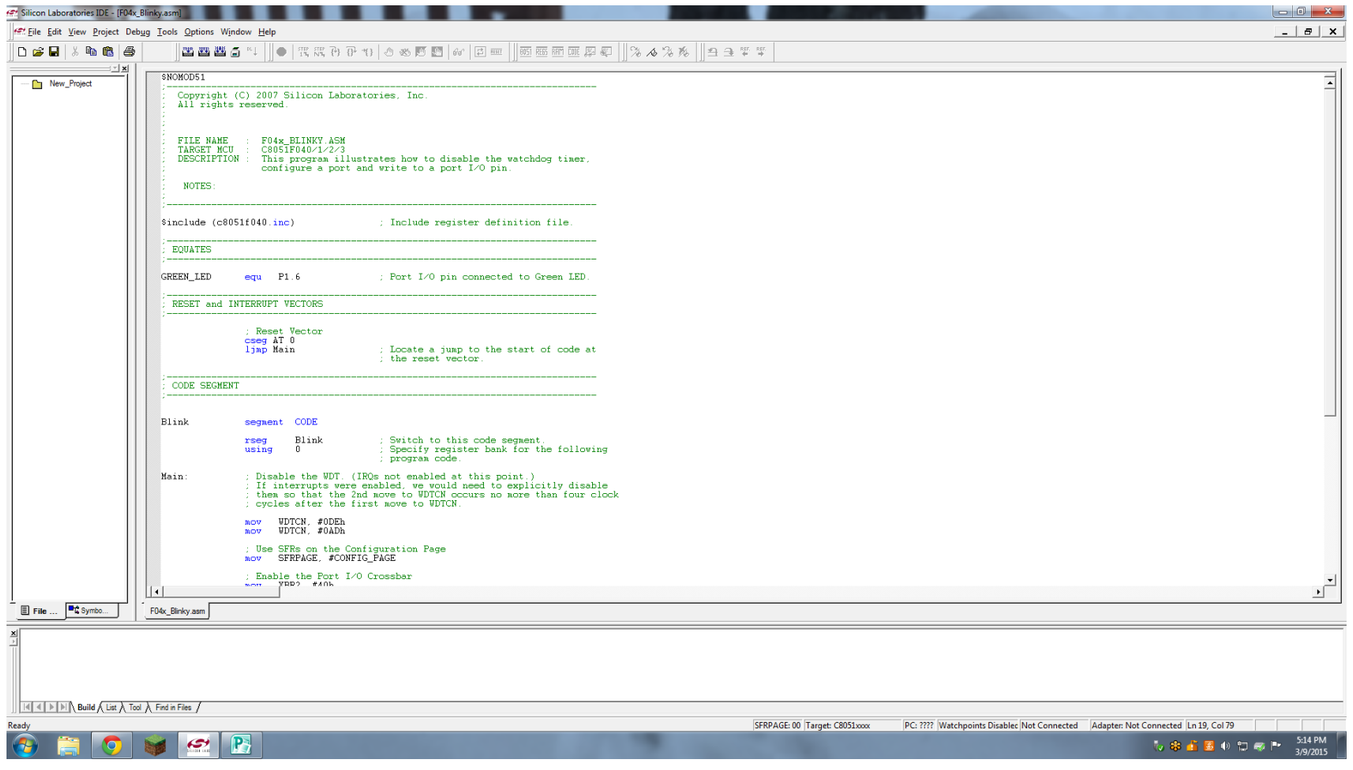
  http://www.silabs.com/Support%20Documents/Software/8BitToolsInstaller-web.exe

- Download an assembler. Recommended assembler: Keil uVision5

  https://www.keil.com/demo/eval/c51.htm

- After both the installers are downloaded, install the software and run the IDE first

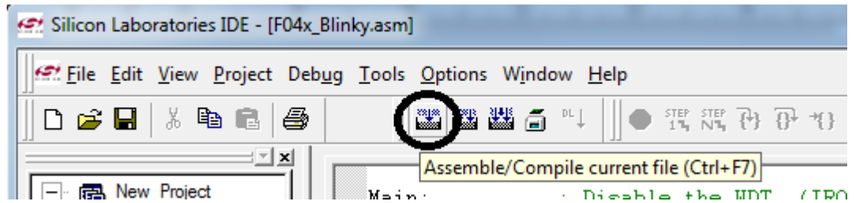
- Then write your program in assembly language

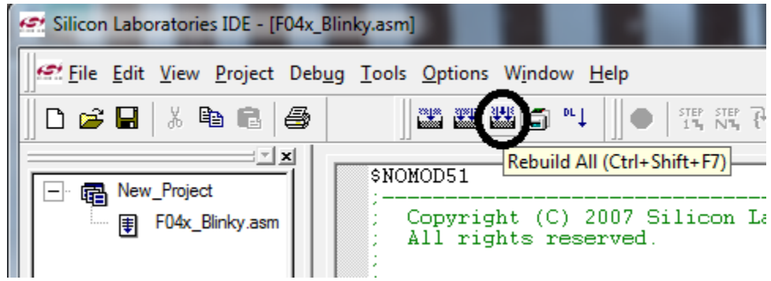

Silicon Laboratories IDE - [F04x_Blinky.asm]
File Edit View Project Debug Tools Options Window Help
New_Project
$NOMOD51
; Copyright (C) 2007 Silicon Laboratories, Inc.
; All rights reserved.
; FILE NAME : F04x_BLINKY.ASM
; TARGET MCU : C8051F040/1/2/3
; DESCRIPTION : This program illustrates how to disable the watchdog timer,
; configure a port and write to a port I/O pin.
; NOTES:
$include (c8051f040.inc) ; Include register definition file.
; EQUATES
GREEN_LED equ P1.6 ; Port I/O pin connected to Green LED.
; RESET and INTERRUPT VECTORS
; Reset Vector
cseg AT 0
ljmp Main ; Locate a jump to the start of code at
; the reset vector.
; CODE SEGMENT
Blink segment CODE
rseg Blink ; Switch to this code segment.
using 0 ; Specify register bank for the following
; program code.
Main: ; Disable the WDT. (IRQs not enabled at this point.)
; If interrupts were enabled, we would need to explicitly disable
; them so that the 2nd move to WDTCN occurs no more than four clock
; cycles after the first move to WDTCN.
mov WDTCN, #0DEh
mov WDTCN, #0ADh
; Use SFRs on the Configuration Page
mov SFRPAGE, #CONFIG_PAGE
; Enable the Port I/O Crossbar
File ...
Symbo...
F04x_Blinky.asm
Build List Tool Find in Files
Ready
SFRPAGE: 00 Target: C8051xxxx PC: ???? Watchpoints Disablec Not Connected Adapter: Not Connected Ln 19, Col 79
5:14 PM
3/9/2015

Writing your first program (cont.)

Assembling your code

- After completing your code, click the assemble button as shown
- You may be prompted to find an assembler. Browse for the assembler (Keil uVision5) installed earlier.
- Click rebuild all as shown

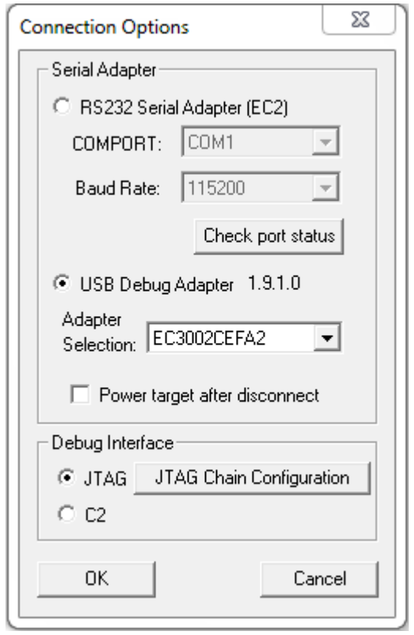

Silicon Laboratories IDE - [F04x_Blinky.asm]
File Edit View Project Debug Tools Options Window Help
Assemble/Compile current file (Ctrl+F7)
New Project

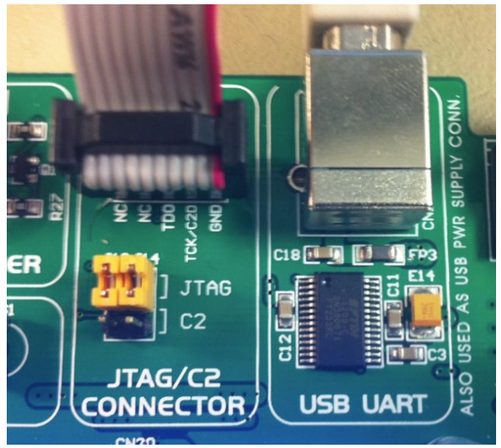


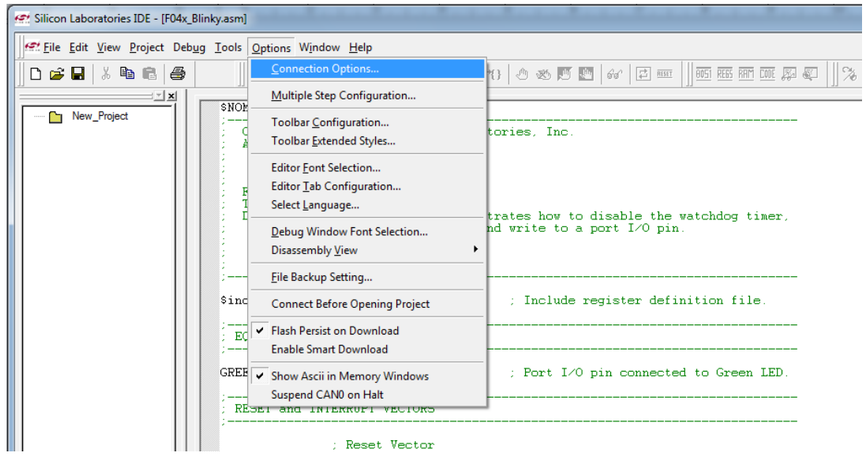
Writing your first program (cont.)

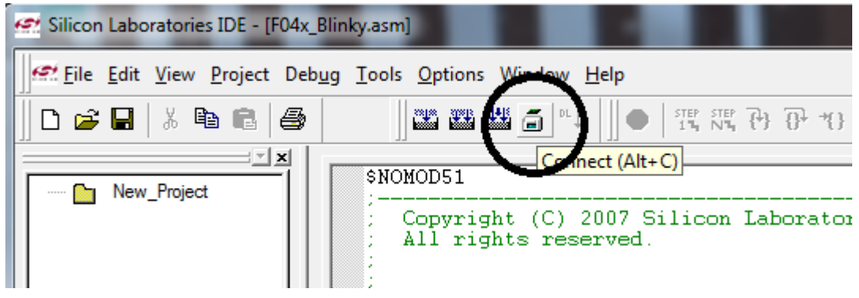
Connecting the IDE with the development board

- Before establishing connection between the development board and the IDE, power on the system as instructed earlier.
- The jumpers J13 and J14 should be in the JTAG position
- Click options and then select Connection Options from the drop down
- In the Connection Options dialog box, select the configuration as shown
- Click connect to establish connection








Silicon Laboratories IDE - [F04x_Blinky.asm]
File Edit View Project Debug Tools Options Window Help
Connect (Alt+C)
New_Project
$NOMOD51
; Copyright (C) 2007 Silicon Laborator
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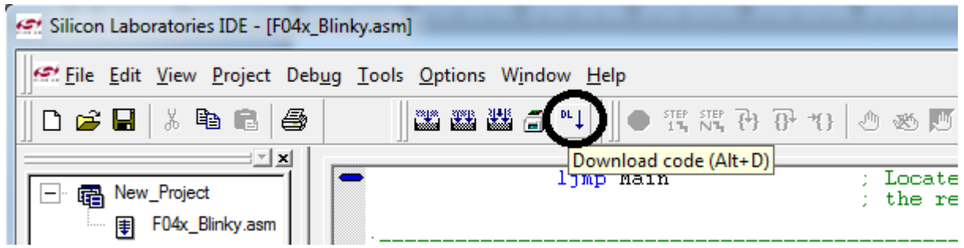
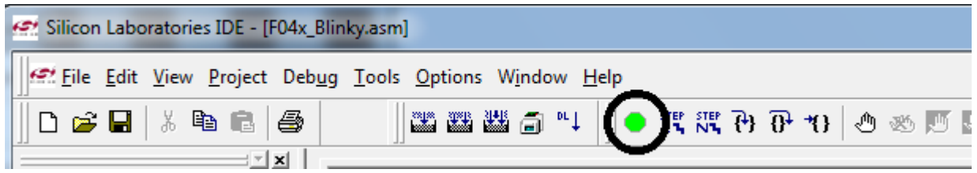
Downloading and running code on 8051

- Click download after connection has been established successfully
- Then click the GO button as shown
- Observe results on the board





Disclaimer

This manual was prepared strictly for academic use. All the information gathered here have been collected via research and aimed to guide any student to start using the BIG 8051 microcontroller. All the pictures of the development system were taken by Sajid Amir and should not be copied.

References:

- http://www.mikroe.com/downloads/get/1460/big8051_manual_v100.pdf
- http://www.silabs.com/Support%20Documents/Software/8051_Instruction_Set.pdf
- http://www.botskool.com/tutorials/electronics/8051/introduction-8051-assembly-language-programming?page=1
- http://users.etown.edu/w/wunderjt/Xilinx%20instructions.pdf
- http://users.etown.edu/w/wunderjt/Instructions%20on%2080251%20Microcontroller%20Board%20and%20Software%20-%20SP11WEB2.htm